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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/173,129 10/15/98 PARK

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TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS TX 75265

EXAMINER

PERALTA, G

ART UNIT

PAPER NUMBER

2814

DATE MAILED:

10/02/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application N .

09/173,129

Applicant(s)

PARK ET AL

Examiner

Ginette Peralta

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 June 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5-9,12-16 and 19-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5-9,12-16 and 19-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claims 1-2, 5-9, 12-16, 19-32 are rejected under 35 U.S.C. 101 because the claimed invention is not supported by either a specific asserted utility or a well established utility.

The claims are directed to a method of fabricating an electrical device formed in a semiconductor substrate, whereby a portion is selectively oxidized by introducing a hydrogen-containing gas and an oxygen-containing gas and having an explosive reaction in the processing chamber. This limitation renders the invention inoperative, as the substrate would be damaged and therefore utility would be lacking.

Claims 1-2, 5-9, 12-16, 19-32 are also rejected under 35 U.S.C. 112, first paragraph. Specifically, since the claimed invention is not supported by either a specific asserted utility or a well established utility for the reasons set forth above, one skilled in the art clearly would not know how to use the claimed invention.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the

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art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-2, 5-9, 12-16, 19-32 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The inclusion of the limitation of "an explosive reaction" between the hydrogen containing gas and the oxygen containing gas is not enabled by the specification and furthermore the process is inoperative.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

6. Claims 1-2, 5-9, 12-15 and 26 are rejected under 35 U.S.C. 102(e) as being anticipated by Nakajima et al. (U.S. Pat. 5,907,188), as previously applied.

Nakajima et al. teaches a method of fabricating an electrical device such as a transistor formed in a semiconductor substrate that comprises forming an insulating layer over the semiconductor substrate, forming a silicon containing structure on the insulating layer, forming a conductive structure on the silicon containing structure, oxidizing a portion of the insulating layer and the silicon containing structure while

leaving the conductive structure substantially unoxidized by introducing an oxygen-containing gas selected from the group of oxygen (O₂) and carbon dioxide (CO₂), and hydrogen (H₂) to the insulating layer, the silicon containing structure and the conductive structure; wherein the insulating layer comprises silicon oxide; wherein the silicon containing structure comprises polycrystalline silicon; wherein the conductive structure comprises an oxygen-sensitive material; wherein the conductive structure comprises tungsten; wherein the oxidizing step comprises introducing the oxygen containing gas and the hydrogen gas in a portion of a process chamber's total volume; and wherein the reaction between O₂ and H₂ does not increase the pressure in the processing chamber beyond a predetermined level (Col. 6, lines 34-55).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 20, 21, 23, 27-28, and 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al., as previously applied.

Nakajima et al. teaches a method of fabricating an electrical device formed in a semiconductor substrate that comprises forming an insulating layer over the semiconductor substrate, forming a silicon containing structure on the insulating layer,

forming a conductive structure on the silicon containing structure, oxidizing a portion of the insulating layer and the silicon containing structure while leaving the conductive structure substantially unoxidized by introducing an oxygen-containing gas selected from the group of oxygen (O_2) and carbon dioxide (CO_2), and hydrogen (H_2) to the insulating layer, the silicon containing structure and the conductive structure, and wherein the reaction between O_2 and H_2 does not increase the pressure in the processing chamber beyond a predetermined level (Col. 6, lines 34-55), by introducing the H_2 at low partial pressure, lower than the explosion limit.

Thus, Nakajima et al. is shown to teach all of the features of the claim with the exception of increasing the concentration of one of oxygen or hydrogen after a reaction begins, and increasing the pressure of the chamber as the reaction begins.

It would have been within the scope of one of ordinary skill in the art to vary the concentration of one of the reactants after the introduction into the chamber and the reaction begins, in order to form an oxide with a desired thickness, therefore it would not yield any unexpected results as the selectivity towards the conductive structure is maintained by the use of specific reactive gases, and that the reaction occurs continuously as the O_2 and H_2 enter the chamber as the gases are introduced at a temperature where the reaction is favored, and the total pressure is controlled by starting the flow of hydrogen at a lower pressure in order to prevent a violent reaction.

9. Claims 16, 22, 24, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komori et al. in view of Nakajima et al..

Komori et al. teaches a method of fabricating a memory cell as in Fig. 13 formed in a semiconductor substrate comprising the steps of providing a conductive layer 9 over the semiconductor substrate 5, providing a dielectric material 10 over the conductive layer 9, subjecting the conductive layer 9 and the dielectric material 10 to an oxygen-containing gas and a separate hydrogen-containing gas, wherein the dielectric material is oxidized and the conductive layer remains substantially unoxidized, oxygen-containing gas comprises H₂O, and the hydrogen-containing gas comprises H₂, and wherein the reaction between O₂ and H₂ does not increase the pressure in the processing chamber beyond a predetermined level (Col. 6, lines 34-55).

Nakajima et al. teaches a method of oxidizing a dielectric layer and a silicon containing layer by introducing an oxygen containing gas that is selected from H₂O and O₂ and a hydrogen containing gas comprising H₂.

It would have been within the scope of one of ordinary skill in the art to use the selective oxidation-of Nakajima et al. for the construction of a reliable capacitor where the conductive layer is left substantially unoxidized and to vary the concentration of one of the reactants after the introduction into the chamber and the reaction begins, in order to form an oxide with a desired thickness, therefore it would not yield any unexpected results as the selectivity towards the conductive structure is maintained by the use of specific reactive gases, and that the reaction occurs continuously as the O₂ and H₂ enter the chamber as the gases are introduced at a temperature where the

reaction is favored, and the total pressure is controlled by starting the flow of hydrogen at a lower pressure in order to prevent a violent reaction.

10. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Komori et al. in view of Nakajima et al. as applied to claim 16 above, and further in view of Wolf.

Komori et al. as modified by Nakajima et al. teaches all the limitations in the claim with the exception of the use of a dielectric material comprising a material selected from the group consisting of an oxide/nitride stack, BST, tantalum pentoxide or PZT.

Wolf teaches in Page 598 the use of tantalum pentoxide and oxide/nitride stacks instead of silicon oxide for a capacitor dielectric.

It would have been obvious to one of ordinary skill in the art to use either tantalum pentoxide or an oxide/nitride stack as dielectric as taught by Wolf, as these materials can increase the cell capacitance.

Response to Arguments

11. Applicant's arguments filed 6/29/01 have been fully considered but they are not persuasive.

With regards to Applicant's argument regarding the newly added limitation of the reaction of H₂ and O₂, being explosive and not increasing the pressure in the processing chamber beyond a predetermined level, it is noted in Col. 6, lines 34-55, that Nakajima et al. teaches the introduction of H₂ at a lower pressure in order to prevent

the pressure in the processing chamber to increase beyond a predetermined level, for the same motivation of the Applicant of preventing the violent reaction between the reactants and an explosion in the chamber. Furthermore it is noted that in processing explosive reactions are evaded as they are difficult to control, and the pressure levels inside the chambers usually are too high.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ginette Peralta whose telephone number is (703)305-7722. The examiner can normally be reached on Monday to Friday 8:00 AM-4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703)306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

GP
September 30, 2001


Olik Chaudhuri
Supervisory Patent Examiner
Technology Center 2800